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Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

CHARLES ALFRED WEATHERBY
LUDLOW GRISCOM
STUART KIMBALL HARRIS
} Associate Editors

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HELENIUM AUTUMNALE: FIGS. 1 and 2, portions of TYPE, × 1, from photograph sent from *Linnean Society of London;* FIG. 3, flowering summit, × 1, of modern specimen from Ohio

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COTYPE, SYNTYPE, AND OTHER TERMS REFERRING TO TYPE MATERIAL

S. F. Blake

As indicated by Joseph Ewan in a recent note in Chronica Botanica (**7**: 8–9. 1942), the term "cotype" has been wrongly used by some botanical writers to designate specimens of the type collection of a species (or other taxonomic unit) other than the actual type. The definition of "cotype" which Ewan cites from Hitchcock (Science n. s. **21**: 832. 1905), a specimen "cited with the original description in addition to the type specimen," is also incorrect on the basis of the original definition of the term and subsequent extensive usage, and seems to have led some botanists astray. The word "cotype" (written with the superfluous hyphen) was apparently first proposed in print by Oldfield Thomas in 1893 (Proc. Zool. Soc. 1893: 241–242). In this short but important paper, in which he sought to clarify terms relating to type material, he stated: "Already, as a step towards this end, the word 'co-type' has been introduced[1] for any specimen which was one of several forming the basis of the original description; but, like 'type,' it has become loosely and vaguely used for different sorts and classes of specimens, and equally needs definition and pinning down to one particular class, for which alone it should be used." He then gave these definitions (p. 242): "A *Co-type* is one of two or more specimens together forming the basis of a species, no *type* having been selected. No species would have both type and co-types, but either the former, or

[1] I believe in the first case by my colleague Mr. C. O. Waterhouse.

two or more of the latter." "A *Para-type* is a specimen belonging to the original series, but not the type, in cases where the author has himself selected a type. It should, however, be one of the specimens mentioned or enumerated in the original description." The anonymous editor of Natural Science, in an article entitled "Scientific Volapuk," altered "co-type" to "syntype" on puristic grounds (Natural Science **4:** 57. 1894). F. A. Bather (l. c. **4:** 160. 1894) and Charles Schuchert and S. S. Buckman (Ann. & Mag. Nat. Hist. VII. **16:** 103. 1905) concurred in this change, but Schuchert, in his important catalogue of type specimens of fossil invertebrates in the U. S. National Museum, published in the same year (1905), used exclusively the term cotype (Bull. U. S. Nat. Mus. **53**[1]**:** 11 (definition) and throughout the text).

The correction of "cotype" to "syntype" has sometimes been attributed to Bather, but this is incorrect; the change was made by the anonymous editor of "Natural Science." In any case, it is an unnecessary one. *Typus* is a perfectly good Latin word, derived of course from the Greek τύπος, and Thomas (or Waterhouse) was guilty of no etymological hybridization in using the form "cotype." The fact that essentially all other terms of this nature are derived from Greek words in conjunction with "type" does not affect the validity of this term. The additional fact that the word has been misused in two different ways by botanical authors is no compelling reason for abandoning it. Have we any assurance that such authors will use syntype correctly?

The nature of type material in botany differs from that in zoology in three principal respects. In general, botanists collect several or many individuals or fragments of a given species in the same spot at the same time and distribute them to herbaria under a given number. For practical purposes (except in the case, relatively very uncommon at least in vascular plants, of mixture of two or more species in collecting) these specimens are equivalent, and the citation of collectors' numbers in a monograph or an original description provides a ready means for the identification of specimens in herbaria not examined by the monographer or describer. The designation of a specimen of *Smith* 1234 in a given herbarium as the type of a new species makes that number wherever represented the type collection.

The existence of duplicate type material (isotypes: see below) is consequently very common in botany, with attendant beneficial results in taxonomy. The precise equivalent is scarcely known to zoologists, although its place is taken more or less satisfactorily by topotypes.

In the second place, when the zoologist speaks of a type (or holotype, if he uses that word) he practically always refers to a single specimen of the organism he is dealing with. When the botanist cites a type, he ordinarily refers to a sheet of mounted material (vascular plants) or a pocket containing one to many individuals of a moss, lichen, or fungus, or a mounted slide bearing one to many individuals of a microscopic form. Since a type proper (holotype) is by definition an individual specimen, it follows that the type sheet or pocket or slide, when it bears more than one individual or parts of individuals is not a holotype but a group of cotypes. Ordinarily these are conspecific, but sometimes they are not, and it then becomes necessary for some student, recognizing the true state of affairs, to select a single specimen as lectotype, or at least to clarify the case by excluding the material not belonging to the species as restricted by him. The situation then is just as it is when it becomes necessary to select a type from several specimens of different collections cited in the description of a new species by an author writing in the days before the designation of types had become established.

A third difference of considerable practical importance is found in the fact that botanical specimens, generally speaking, are metameristic in nature while zoological specimens are not, except in some of the lower forms such as bryozoa and corals. The animal specimen is an entity and cannot suffer the loss of any of its parts without irreparable damage. The plant specimen, in very many cases, bears so many flowers, fruits, and leaves that fragments can be spared for deposit in other herbaria, and these fragments showing the distinctive technical characters, particularly if accompanied by a photograph, not only make it possible for the distant monographer to make certain of the identity of the plant in question but for practical purposes multiply the type and afford a safeguard against its accidental or purposive destruction—a consideration not without significance in A. D. 1943.

Of the multitude of terms that have been proposed relating to type material, conveniently summarized by D. L. Frizzell in 1933 ("Terminology of types," American Midland Naturalist **14:** 637–668), very few are really necessary in actual practice. Frizzell lists 233 altogether (including different usages of the same term), but recommends the general use of only 10, of which one (genotype) refers to a species and not to a specimen. For ordinary botanical usage, six would seem to be sufficient, and most of these will be used but seldom.

In practice, we may expect botanical authors to use the word "type" to designate the actual physical unit of preparation with which they are dealing (a sheet bearing one or several mounted specimens, a pocket of mosses or lichens, a mounted slide of microscopic forms), leaving to subsequent students the selection of a holotype when the growth of knowledge makes this necessary; and we may hope that they will agree on the use of "isotype" for duplicate specimens of the type collection. The other terms defined below will scarcely be needed except in critical discussions.

HOLOTYPE. The single specimen (or fragment) upon which a species or other form is based. For systematic botanical work the *type* of ordinary usage is a practical although not a strict equivalent.

COTYPE. Any specimen of the author's original material (when more than one) when no type was designated. *Syntype* of some authors.

PARATYPE. Each of the specimens other than the type upon which an original description is based. *Cotype* of some botanists (incorrectly). The term "paratype" applies only to specimens actually examined by the describer; duplicates of a paratype in other herbaria would properly be designated not as paratypes, but as of the paratype collection. (The practice current among entomologists of selecting some of the specimens cited in the original description, frequently not from the type locality, for designation as "paratypes" is obviously based on a misunderstanding of the proper meaning of the word. All the specimens, except the type, used in preparing the original description become paratypes automatically.)

ISOTYPE. Any specimen of the type collection other than the actual type. This term, introduced by F. W. Pennell in 1919 (Torreya **19:** 13) is omitted from Frizzell's paper, although he gives the same word as used by Gill in 1881 in a zoogeographical sense. Specimens of the type collection actually used in the preparation of the original description (= "protolog" of Schuch-

Photo. B. G. Schubert.

HELENIUM AUTUMNALE, var. CANALICULATUM, all figs. × 1 (except FIG. 5): FIG. 1, portion of plant of Hortus Cliffortianus, courtesy of Dr. *John Ramsbottom;* FIG. 2, summit of wild specimen from Quebec; FIG. 3, portion of original plate of *H. canaliculatum;* FIGS. 4 and 5, portions of Cornut plate

Photo. B. G. Schubert.

HELENIUM AUTUMNALE, VAR. PARVIFLORUM, both figs. × 1: FIG. 1, portion of TYPE or ISOTYPE of H. PARVIFLORUM Nutt.; FIG. 2, summit of recent specimen from Virginia

ert and Buckman) are paratypes as well as isotypes and should be so labeled. If the type specimen is lost or unavailable an isotype is in general much more important than a paratype for the interpretation of a name.

Lectotype. A holotype selected from among cotypes subsequent to the original description. It should be selected by a reviser on the basis of actual study of the original description and all the material involved in it, not mechanically on the basis of priority of position or because the name of one of the collectors was adopted for the specific name.

Topotype. A specimen from the type locality.

Division of Plant Exploration and Introduction,
Bureau of Plant Industry,
Washington, D. C.

VIRGINIAN BOTANIZING UNDER RESTRICTIONS

M. L. Fernald

(*Continued from page 480*)

Some Varieties and Species of Helenium (Plates 796–799).—As a genus *Helenium*, in its present sense, was first called *Helenia* L. Hort. Cliff. 418 (1737). It consisted of a single species, *Helenia foliis decurrentibus*, based in part on the plant of Clifford's garden (our plate 797, fig. 1), in part upon many references to previously described plants of European gardens called *Heleniastrum*, *Chrysanthemum* or *Aster*, the latter not actually before Linnaeus. When the genus was taken up at the nomenclaturally critical date, 1753, and assigned a binomial it was as *Helenium autumnale* L. Sp. Pl. ii. 886 (1753). The citations then given by Linnaeus indicate the two plants somewhat generally found at that time in European gardens, and, although in N. Am. Fl. xxxvi^2. 127 (1915) Rydberg says that the type came from Canada, Linnaeus himself in 1753 was not so explicit, he then saying "*Habitat in* America *septentrionali*". In Hortus Cliffortianus he had said "*in* Florida *&* Canada".

The plant of Clifford's garden (our plate 797, fig. 1) had narrowly lanceolate and long-acuminate, nearly entire leaves, few long-peduncled heads, the mature disk 1.8+ cm. broad, the narrow ligules strongly narrowed at base, 2 cm. long and only 2.5–3.3 mm. broad at the sharply trifid apex. Except that its

leaves are rather more spreading and its branching looser, it closely matches the plant of tidal shores of the St. Lawrence (FIG. 2), there found from near Montreal to below Quebec, and extending westward through much of the St. Lawrence basin and far to the southwest. Rydberg's inference was correct, apparently, that this plant originated in Canada. The second plant cultivated in Europe was the extreme which Linnaeus preserved in his own herbarium (presumably from the Upsala garden) and which, according to the late Dr. B. Daydon Jackson, was before him in preparing Species Plantarum, ed. 1. This (our PLATE 796, FIG. 1) is the coarser plant of our Northeast, with more elliptic and broader, toothed leaves, and large heads, with the mature disk of the leading head nearly 2.2 cm. broad, the flat and cuneate ligules 2.2–2.3 cm. long and 8.3–11.7 mm. broad at the bluntly lobed summit. Just such a plant (FIG. 2), with ligules up to 2.5 cm. long, occurs from western New England to Minnesota, south to New Jersey, upland to western North Carolina, Kentucky and Missouri. *Helenium autumnale* of 1753 consisted of both extremes and there is logic in interpreting either of them as the type. In a nomenclature beginning with 1753 (not 1737 and earlier), however, the plant in the Linnean Herbarium, the specimen Linnaeus definitely had before him in preparing Species Plantarum, is here selected. It is the extreme of the species which most students of the past have treated as *H. autumnale*, as will later be noted.

Both of them being in European gardens, whence they were described by Ventenat in 1720, Miller, with no reference to Linnaeus, took his cues directly from Ventenat, not from the Linnean Herbarium. Miller called *Helenium autumnale* the narrow-leaved extreme, the "*Bastard Sun-flower with a longer and narrower leaf*," the *Heleniastrum folio longiore & angustiore* of Ventenat; and the plant with broader leaves and larger heads, the *Heleniastrum folio breviore & latiore* of Ventenat, Miller called *Helenium latifolium* Mill. Gard. Dict. ed. 8 (1768), the "*Bastard Sun-flower with a broader and shorter leaf*". Among botanists of the period, however, Miller was essentially alone in his interpretation. Lamarck, Smith, Schkuhr and other botanists, far more precise than the very impressionistic Miller, took the broad-leaved and large-headed plant (our PLATE 796) of the Linnean Herbarium as

true *H. autumnale*. Thus Lamarck described as a new species, *H. canaliculatum* Lam. in Journ. d'Hist. Nat. ii. 213, t. 35 (1793) the narrow-leaved plant of European gardens which Ventenat had called *Heleniastrum folio longiore & angustiore* and which Miller took up as *H. autumnale*. Lamarck's description and life-sized illustration (our PLATE 797, FIG. 3) indicated unbranched plants with solitary large heads with ligules 1.6 cm. long and only 3–5 mm. broad at the sharply toothed summit: "Semi-flosculi 15–18, foeminei, distincti, patentes: ligulis concavo-canaliculatis, apice tridentatis". Lamarck went on "L'*Helenie canaliculée* diffère évidemment de l'*Helenie* d'automne (dict. vol. 3, pl. 81) . . . par son aspect, son port, et principalement par le caractère de ses demi-fleurons, qui ne sont point élargis, planes, et réfléchis comme dans ces [referring to both *H. autumnale* and *H. quadridentatum*] espèces"; and in summary he contrasted his *H. canaliculatum* "*semi-flosculis canaliculatis*" and *H. autumnale* "*semi-flosculis planis reflexis*". Somewhat later Lamarck, Ill. iv. t. 688, fig. 1 (1797), illustrated his conception of *H. autumnale*, the plant of the Linnean Herbarium.

Helenium canaliculatum Lam. (portion of his illustration, shown in our PLATE 797, FIG. 3) was unquestionably the same as the plant (our PLATE 797, FIG. 1) of the Clifford garden. Except for the more spreading leaves, a natural response to the ameliorations of cultivation, *H. canaliculatum* is the extreme (FIG. 2) of *H. autumnale* which characterizes the tidal shores of the St. Lawrence from above Montreal to below Quebec, thence westward to Minnesota and Iowa. That region was the source of many plants early carried to Europe and a very inexact and obviously conventionalized plate of it with similarly elongate leaves, too many heads for the wild plant, and tremendously multiplied but characteristic rays was described and illustrated as *Aster luteus alatus* by Cornut, Canadensium Plantarum, 62, 63 (1635). The life-sized head and reduced leaves from Cornut's plate are here reproduced as PLATE 797, FIGS. 4 and 5. It will be noted that its disk is 2 cm. broad, its ligules about 1.5 cm. long and 4–5 mm. broad at the sharply toothed summit. It is obviously of the same variety as the plant of the Clifford garden and as that of the Paris garden described and illustrated by Lamarck as his *H. canaliculatum*.

When Sir James Edward Smith purchased and eventually established in London the herbarium of Linnaeus he intimately knew the collection and in his many articles in Rees' Cyclopedia he clearly designated what he understood, from studying the collection and literature, as the types of many Linnean species. Thus, in Rees, Cycl. xvii. (1819), he took as *H. autumnale* the plant of the Linnean Herbarium with "*Leaves* elliptic-lanceolate, . . . more or less deeply serrated. *Flowers* large", etc., while for the plant of European gardens with "*Leaves* linear-lanceolate, entire", etc., the *H. autumnale* sensu Miller, he proposed the new name *H. longifolium* Sm. In treating as typical *Helenium autumnale* the plant which Lamarck had already (1793) selected and which he soon (1797) illustrated I am not only following the very careful Lamarck and Smith but am trying to keep the concept which has prevailed among most botanists until Rydberg. Witness, besides the illustration by Lamarck and the treatment by Smith, the following illustrations of *H. autumnale:* Schkuhr, Bot. Handb. ed. 2, t. 250a (1808); Barton, Fl. N. Am. i. t. 26 (1821); Raf. Med. Fl. i. t. 47 (1828); Hook. in Bot. Mag. lvii. t. 2999 (1830); Meehan, Fl. and Fern U. S. ii. t. 29 (1879); and so on to Britton & Brown, Ill. Fl. iii. 450 (1898) and House, Wild Fl. N. Y. ii. t. 261 (1918). By so doing less violence is done well established and fully justified usage than by taking up for the plant of Linnaeus's own herbarium, labeled by him *H. autumnale,* the name *H. latifolium* Mill., as is done by Rydberg in the N. Am. Fl. xxxiv^2. 127 (1915). In there taking up as *H. autumnale* the *H. longifolium* Sm. Rydberg showed that he did not understand the latter. If he had understood it he would not have referred *H. canaliculatum* Lam. (clearly *H. autumnale* sensu Miller and *H. longifolium* Sm.) without question to the synonymy of *H. latifolium;* and if he had understood *H. autumnale* of Herb. L. and of Lamarck, Schkuhr, Smith, Barton *et al.* (*H. latifolium* Mill.) he would not have contented himself with "ligules 10–15 mm. long". In the type they are 2.3 cm. long.

Besides typical *Helenium autumnale* (*H. latifolium* Mill.) and the rather local var. *canaliculatum* (Lam.) Torr. & Gray, Fl. N. Am. ii. 284 (1842), a combination not cited in the North American Flora, we have a wide-ranging southern extreme of the species (PLATE 798), the plant with small and *narrow* rays which was

described as a species, *H. parviflorum* Nutt. Although *H. parviflorum* in most extreme variations is very different from true *H. autumnale*, their ranges overlap and it is most difficult to find any stable morphological character to keep them apart. The chief claim of *H. parviflorum* to recognition is its extension far south of the other varieties, a plant with the flowering and fruiting disk only 0.8–1.5 cm. broad (as opposed to 1.6–2.3 cm. in true *H. autumnale*), the ligules 3–12 mm. long and only 3–7 mm. broad (as opposed to 1.6–2.5 cm. long and 7–12 mm. broad in true *H. autumnale*). For six days (a full week) I have boiled out disk-florets and ligules, seeking in the *H. autumnale* complex some stable characters of disk-corollas, pappus and achenes, and, although there is extreme diversity in the number, shape and length of the pales of the pappus, sometimes short, sometimes much longer and more slender, sometimes in several lengths, and while the disk-corollas may have very short or almost obsolete tubes, or the tubes may be prolonged and the throat more campanulate, I have been quite incapable of making these divergencies fall into clear geographic patterns or associate themselves with other characters. After concentrated study for a week I get back to the decision of Torrey & Gray who wrote: "Some of our varieties are possibly species; but they accord in every thing but the pappus, which also presents every intermediate gradation. The var. β. [the western var. *grandiflorum* (Nutt.) Torr. & Gray] is the only state we have seen from Oregon, Saskatchewan, &c.: but a state with a nearly similar pappus is common in New York; while other specimens, otherwise undistinguishable, present a reduced and merely acute pappus".—Torr. & Gray, l. c. (1842). Torrey & Gray had a score or so of specimens; the ten score of specimens from which I have boiled (to clarify and straighten) the florets have failed to bring any more clarification than they could get from their hand-full of material.

Excluding the plants from west of the "Manual range", the great bulk of inclusive *Helenium autumnale* seems to me to fall into three recognizable geographic varieties:

Helenium autumnale L. Sp. Pl. ii. 886 (1753) in part (as to plant of Herb. L. bearing the identification of Linnaeus); Lam. in Journ. d'Hist. Nat. ii. 215 (1793) and Ill. iv. t. 688, fig. 1 (1797);

Schkuhr, Bot. Handb. ed. 2, t. 250a (1808); Smith in Rees, Cycl. xvii (1819); Barton, Fl. N. Am. i. t. 26 (1821); Raf. Med. Fl. i. t. 47 (1828); Hook. in Bot. Mag. lvii. t. 2999 (1830); Torr. & Gray, Fl. N. Am. ii. 384 (1842); Meehan, Fl. and Ferns U. S. ii. t. 29 (1879); Britton & Brown, Ill. Fl. iii. 450 (1898); House, Wild Fl. N. Y. ii. t. 261 (1918). *H. latifolium* Mill. Gard. Dict. ed. 8, *Helenium* no. 2 (1768); Rydb. in N. Am. Fl. xxxiv^2. 127 (1915) as to plant, not as to most citations. *Helenia autumnalis* Hill, Hort. Kew. 6 (1769). *Helenium pumilum* Willd. Enum. Suppl. 60 (1813). *H. altissimum* Link ex Rydberg l. c. 126 (1915).—Stem 0.5–1.5 m. high, wing-angled, simple or branching, corymbose-branched at summit; leaves elliptic, oblong or lanceolate, acuminate, membranaceous, the larger coarsely dentate ones 0.5–1.6 dm. long and 2–5.5 cm. broad; heads few-many, peduncled, in terminal corymb; fully developed disk 1.6–2.3 cm. broad; ligules flat, cuneate, deep yellow, soon reflexed, 1.6–2.5 cm. long, 7–12 mm. broad at the bluntly toothed or lobed summit; pappus much shorter than to two thirds as long as disk-corolla.—Rich thickets, meadows and shores, western New England to Minnesota, south to New Jersey, western North Carolina, Kentucky and Missouri, northward passing into var. *canaliculatum*, southward into var. *parviflorum*. A few fairly typical specimens are the following. Massachusetts: Stockbridge, September 5, 1912, *R. Hoffmann;* Sheffield, September 30, 1919, *Churchill.* Connecticut: Hartford, September 15, 1882, *Chas. Wright;* East Haven, October 7, 1902, *Woodward.* New York: Canton, *Phelps*, no. 1001; South Bay, Madison County, *House*, no. 10,815; Sylvan Beach, Oneida Co., *House*, nos. 2843 and 8705; Dryden, *MacDaniels & Eames*, no. 1313. New Jersey: Fieldsboro, *Long*, no. 18,221; southwest of Harrisonville, *Long*, no. 45,269. Pennsylvania: Washington Crossing, Bucks County, September 25, 1923, *Meredith:* Wissahickon Ravine, Philadelphia County, September 24, 1924, *Henry A. Lang;* Sayre, *Barbour*, no. 815. West Virginia; Greenbrier River, Pocahontas County, *Greenman*, no. 534; Hendricks, Tucker County, *Greenman*, no. 536. Ontario: Tobermory, *Krotkov*, no. 7908 (mixed with var. *canaliculatum*). Ohio: Garrettsville, Portage County, *R. J. Webb*, no. 400. Illinois: Bloomington, August, 1886, *B. L. Robinson.* Our plate 796.

Var. canaliculatum (Lam.) Torr. & Gray, Fl. N. Am. ii. 284 (1842). *H. autumnale* L. Sp. Pl. ii. 886 (1753) in part, as to some citations, not as to plant of Linnean Herb. designated by Linnaeus; Mill. Gard. Dict. ed. 8 (1768); Rydb. in N. Am. Fl. xxiv^2. 127 (1915). *H. pubescens* Ait. Hort. Kew. iii. 227 (1789). *H. canaliculatum* Lam. in Journ. d'Hist. Nat. ii. 213, t. 35 (1793). *Halenie decurrens* Moench, Meth. 589 (1794), both as to description and citation only of the Morison figure which is of most

characteristic *H. canaliculatum*, and obviously copied from Cornut. *Helenium longifolium* Sm. in Rees, Cycl. xvii, *Helenium* no. 2 (1819). *H. autumnale pubescens* (Ait.) Britton in Mem. Torr. Bot. Cl. v. 339 (1894).—Stem relatively slender, 3.7–9 dm. high with 1–many heads; leaves linear to lanceolate, entire or shallowly denticulate, firm, subrigid, the larger ones 3–12 cm. long and 3–18 mm. broad; mature disk 1–2 cm. broad, ligules strongly narrowed and often convolute at base, 1–2 cm. long, and 2–7 mm. broad at the shallowly and sharply to bluntly toothed summit.—Estuary of the St. Lawrence River, Quebec, west to Minnesota and Nebraska, south to Massachusetts (adventive), New York and northern Ohio, Indiana, Illinois, Missouri, Texas and Arizona.[1] Some characteristic specimens are as follows: Quebec: Cap Rouge, *Victorin*, no. 28,177; St. Vallier, *Svenson & Fassett*, no. 3022; Berthier, Montmagny County, *Fernald & Pease*, no. 25,324; Longueuil, *Victorin*, no. 18,376; Boucherville, *Victorin*, no. 27,574. Massachusetts: Clam Shell Bluff, Concord, September 9, 1934, *R. J. Eaton* (adventive, leaves more toothed than in most material). New York: Canton, *Phelps*, no. 1002; Springport, *Eames & Wiegand*, no. 11,007. Ontario: Tobermory, *Krotkov*, no. 7908 (mixed with typical *H. autumnale*); Birch Island, Lake Huron, *Macoun*, no. 26,508 (distributed as *H. huronense* Britton, an herbarium-name unfortunately published in synonymy, therefore with no status, by Rydberg in N. Am. Fl. xxxiv[2]. 127 (1915)). Ohio: Windham Township, Portage County, *R. J. Webb*, no. 5554. Wisconsin: St. Croix Falls, August 20, 1900, *C. F. Baker;* La Crosse, *Pammel*. Illinois: Aurora, September, 1882, *T. E. Boyce;* Urbana, *Pease*, no. 12,504. Minnesota: Lake City, August 15, 1883, *W. H. Manning*. Iowa: Iowa Falls, Hardin County, August, 1928, *M. E. Peck;* Redfield, Dallas County, August 27, 1867, *J. A. Allen;* Fayette, August, 1894, *Fink*. Nebraska: Beaver Creek, Holt Co., *Fred Clements*, no. 2858; South Fork of Dismal River, *Rydberg*, no. 1690. Missouri: Dodson, *Bush*, no. 4148, distrib. as *H. montanum;* Columbia, Boone Co., *Lisle Jeffrey*, no. 261. Kansas: Chautauqua Co., *Hitchcock*, no. 737. Texas: banks of streamlets about Friedrichsburg, *Lindheimer*, no. 477. Arizona: cañon at Fort

[1] Passing westward, from Saskatchewan and North Dakota to eastern Washington, south to New Mexico, into the shorter- and broader-leaved

Var. **montanum** (Nutt.), stat. nov. *H. montanum* Nutt. in Trans. Am. Phil. Soc. n. s. vii. 384 (1841).

For note on *H. autumnale pubescens* (Ait.) Britton see p. 492. It is probable that Aiton had the two plants which were in general cultivation in Europe, not the western var. *montanum* to which Rydberg doubtfully refers var. *pubescens*.

Farther west, in British Columbia, Washington and Oregon, becoming the large-flowered

Var. grandiflorum (Nutt.) Torr. & Gray, Fl. N. Am. ii. 384 (1842); Gray, Syn. Fl. N. Am. i[2]. 349 (1884); independently published by Howell, Fl. Nw. Am. 359 (1900). *H. grandiflorum* Nutt. l. c. (1841).

Huachuca, *Lemmon*, no. 2776. Plate 797.—Many specimens transitional to the preceding and the following, and on the Plains of the West to var. *montanum*.

Aiton, Hort. Kew. iii. 227 (1789), had a *H. pubescens*, described simply "H. foliis pubescentibus". Torrey & Gray and, later, Gray treated it as synonymous with the inclusive *H. autumnale*, of which the typical variety is subglabrous, in both places wrongly citing the page as "287". In Mem. Torr. Bot. Cl. v. 339 (1894) we get the unexplained combination *H. autumnale pubescens* Britton, based upon *H. pubescens* Ait. of page "287". Had the author of the new trinomial looked up Aiton, instead of copying the error of Torrey & Gray and of Gray, he would have noted that *H. pubescens* was on p. 227. I have not seen Aiton's type; neither had Britton. From the date (1789) it is probably var. *canaliculatum*.

*Var. **parviflorum** (Nutt.) stat. nov. *H. parviflorum* Nutt. in Trans. Am. Phil. Soc. ser. 2, vii. 384 (1841).—Leaves membranaceous or submembranaceous, elliptic, oblong, lanceolate or oblanceolate, coarsely toothed to subentire, the larger ones 0.5–1.5 dm. long and 0.7–3.5 cm. broad; mature disk 0.8–1.5 cm. broad; ligules 3–12 mm. long and 3–7 mm. broad, often canaliculate below.—Bottomlands, swamps and other low grounds, Florida to Arkansas, north to Connecticut, New York, Pennsylvania, Kentucky, Illinois and southeastern Iowa, thoroughly typical and isolated southward, passing insensibly into the two preceding northward. The following, from a very large series before me, are characteristic. Connecticut: Sprague, August 9, 1900, *Woodward;* Selden Cove, Lyme, August 29, 1901, *Bissell;* Stratford, August 16, 1895, *Eames*. New York: old specimens without designated locality, *Torr. & Gray, Fl.* New Jersey: east of Silverton, Ocean County, *Fogg*, no. 4901 (narrowest-leaved extreme); Mays Landing, August 28, 1910, *W. Stone;* Cold Spring, *Fogg*, no. 235; Treasure Island, Hunterdon County, *Long*, no. 38,291. Pennsylvania: Delaware County, 1861, *Canby*, called by Gray *H. parviflorum*, with the later comment "Passes for but ??", the material (relatively thin-leaved) marked by Rydberg as *H. longifolium* Sm., i. e. *H. autumnale* var. *canaliculatum;* Dillerville Swamp, Lancaster County, September 18, 1889, *Heller*. Delaware: Bayville, Sussex County, *Fogg*, no. 11,271; north of Leipsic, Kent County, *Fogg*, no. 6230. West Virginia: Roland Park, Cabell County, *Gilbert*, no. 546. Virginia: Hunting Creek, southwest of Alexandria, *G. H. Shull*, no. 188; Bedford County, September, 1873, *A. H. Curtiss;* Jamestown Island, James City County, *Fernald &*

Photo. B. G. Schubert.

HELENIUM GODFREYI: FIG. 1, TYPE, × ½; FIG. 2, achene, × 10
H. FLORIDANUM: FIG. 3, portion of TYPE, × 1; FIG. 4, achene, × 10
H. NUDIFLORUM: FIG. 5, achene, × 10

Photo. B. G. Schubert.

SENECIO AUREUS: FIG. 1, portions of TYPE, × 1, from photograph sent from *Linnean Society of London;* FIG. 2, achene, × 10, from Virginia
S. TOMENTOSUS: achene, × 10, from Virginia

Long, no. 11,204; Kittewan Creek, Weyanoke, Charles City County, *Fernald & Long*, no. 11,483; near Creeds, Princess Anne County, *Fernald, Long & Fogg*, no. 5139; Northwest, Norfolk County, *Fernald & Long*, no. 14,068; northwest of Suffolk, *Fernald & Long*, no. 13,833; Factory Hill, Nansemond County, *Fernald & Long*, no. 4914; south of South Quay, Nansemond County, *Fernald & Long*, no. 11,482; southeast of Burgess, Dinwiddie County, *Fernald & Long*, no. 7713; southeast of Stony Creek, Sussex County, *Fernald & Long*, no. 13,832; Meherrin River, south of Edgerton, Brunswick County, *Fernald & Lewis*, nos. 14,515 (leaves short, broad and sparsely toothed) and 14,516 (leaves narrower and sharply and copiously toothed). North Carolina: near Hillsboro, Columbus County, *Godfrey*, no. 6278; north of Burgaw, Pender County, *Godfrey*, no. 6537; near Sunford, Lee County, *Godfrey*, no. 6911; Winston-Salem, *Godfrey*, no. 6094; Sylva, Jackson County, September 18, 1897, *E. E. Magee.* South Carolina: near Georgetown, *Godfrey & Tryon*, no. 8240. Georgia: Macon, September 3, 1883, *J. D. Smith;* Warsaw, Long County, *Eyles*, no. 7655. Florida: St. Mark's, Wakulla County, *Nash*, no. 2534; Apalachicola, *Biltmore Herb.*, no. 515a. Kentucky: near Wasioto, Bell County, *Kearney*, no. 506. Tennessee: Knoxville, *W. A. Anderson*, no. 638; Townsend, September 26, 1936, *Luther Burns.* Alabama: without stated locality, *Nuttall* (possible type or isotype of *H. parviflorum* —bearing Nuttall's asterisk and entirely agreeing with his description, although as noted by Gray, Syn. Fl. i^2. 349, Nuttall cited it as from Georgia); on Bogue Chitto, Perry County, September 1, 1885, *J. D. Smith;* near Marion, Perry County, September 2, 1885, *J. D. Smith;* Auburn, Lee County, *Earle & Earle*, no. 89. Mississippi: Taylorville, *Tracy*, no. 8529; Jackson, September 6, 1885, *J. D. Smith.* Illinois: Champaign, *Pease*, no. 12,389; Peoria, September, 1904, *F. E. MacDonald.* Iowa: Keosauqua, *Pammel & Reis*, no. 465. Missouri: Bakersfield, Ozark County, *E. J. Palmer*, no. 32,829; Greenwood, *Bush*, no. 4134; Noel, *Bush*, nos. 5265 and 5270. Plate 798.

In the plastic group with disk globose or globose-ovoid and usually brown or purplish, the receptacle ovoid and the ray-flowers sterile or neutral, Rydberg treats both *Helenium nudiflorum* Nutt. and *H. polyphyllum* Small as good species. Only by recognizing the smallest specimens with narrowest cauline wings as the former, the largest ones with broadest wings as the latter, ignoring the large series of transitional specimens can one do so. The intermediate pile is altogether too large; but in our Southeast there are two extremes, native of low woods and swamps and evidently local endemics, which seem to be really

well defined species. In typical campestrian and aggressively weedy *H. nudiflorum* (including *H. polyphyllum*) the pales of the pappus are narrowly lanceolate to lance-ovate and 0.5–1.6 mm. long, the pales attenuate to narrow tips or scabrous awns, the firm and usually scabridulous cauline leaves linear to narrowly lanceolate or oblanceolate. In southeastern South Carolina, however, there is a plant of this series, occurring in low woods or in wooded bottomlands, with membranaceous and quite smooth cauline leaves lance- to elliptic-oblong, the pappus of blunt and awnless round or oval small pales. This I am calling

H. **Godfreyi,** sp. nov. (TAB. 799, FIG. 1 et 2), *H. nudifloro* habitu simillima; foliis caulinis membranaceis laevibus lanceolato-vel elliptico-oblongis; achaeniis glabris verrucosis, pappi paleis albidis suborbicularibus vel ovalibus muticis 0.4–1.4 mm. longis.—SOUTH CAROLINA: creek-bottom through rich lowland-woods, 4 miles west of Georgetown, June 27, 1939, *Godfrey & Tryon,* no. 124; cleared strip along logging railroad through floodplain-forest, Santee River, 3 miles northeast of Pineville, Berkeley County, July 14, 1939, *Godfrey & Tryon,* no. 586 (TYPE in Herb. Gray.).

This localized species is named for ROBERT KENNETH GODFREY whose extensive field-work is greatly clarifying our knowledge of Carolina plants.

Another relative of *Helenium nudiflorum* is concentrated in the northern half of Florida. In this plant the relatively small heads are either rayless or with well developed ligules, but the ovate pappus-pales (1–1.6 mm. long) are rounded at tip and terminated by a very long, filiform and smoothish awn. This plant seems worthy of recognition as

H. **floridanum,** sp. nov. (TAB. 799, FIG. 3 et 4), capitulis valde corymbosis radiatis vel eradiatis; pappi paleis 1–1.6 mm. longis ovatis apice rotundatis abrupte aristatis, aristis filiformibus laevibus.—FLORIDA: moist ground near Jacksonville, May 28, 1891, *Curtiss,* no. 4972; low grounds, Duval County, July, *Curtiss,* no. 1520; hummock-land, Eustis, Lake County, April 15–30, 1894, *Nash,* no. 550; around ponds in pine woods, Sumter County, June 5, *Curtiss,* no. 11; low open woods near Fitzgerald, Hernando County, June 14, 1900, *Curtiss,* no. 6663 (TYPE in Herb. Gray., distributed by Curtiss with an unpublished varietal name and with the note: "Uniformly without rays along the Withlacoochee River"); waste ground in Tampa, June 1, 1886, *Curtiss,* no. 12.

PLATE 796 is of HELENIUM AUTUMNALE L., × 1: FIGS. 1 and 2, portions of TYPE in Linnean Herb., original photograph through kindness of Mr. *S. Savage;* FIG. 2, summit of plant from Garrettsville, Portage County, Ohio, *R. J. Webb,* no. 400.

PLATE 797, H. AUTUMNALE, var. CANALICULATUM (Lam.) Torr. & Gray, × 1, except FIG. 5: FIG. 1, portion of *Helenia foliis decurrentibus,* etc. of Hortus Cliffortianus, courtesy of Dr. *John Ramsbottom;* FIG. 2, summit of plant from River St. Lawrence, Berthier, Montmagny County, Quebec, *Fernald & Pease,* no. 25,324; FIG. 3, portion of original plate of *H. canaliculatum* Lam.; FIGS. 4 and 5, portions of illustration of *Aster luteus alatus* of Cornut, Canad. Pl. (1635).

PLATE 798, H. AUTUMNALE, var. PARVIFLORUM (Nutt.) Fern., × 1: FIG. 1, portion of TYPE or ISOTYPE of *H. parviflorum* Nutt.; FIG. 2, summit of plant from south of South Quay, Nansemond County, Virginia, *Fernald & Long,* no. 11,482.

PLATE 799, FIGS. 1 and 2, H. GODFREYI, n. sp.: FIG. 1, TYPE, × ½; FIG. 2, achene, × 10. FIGS. 3 and 4, H. FLORIDANUM, n. sp.: FIG. 3, fragment of TYPE, × 1; FIG. 4, achene, × 10. FIG. 5, achene, × 10, of H. NUDIFLORUM Nutt., from Emporia, Virginia, *Fernald & Long,* no. 10,451.

SENECIO AUREUS AND ITS GEOGRAPHIC VARIETIES AND ALLIES IN EASTERN NORTH AMERICA (PLATES 800–806)—To one who from boyhood has known as *Senecio aureus* the common glabrous or promptly glabrate plant of peaty meadows, swales and swampy thickets of New England, New York and Pennsylvania, with suborbicular to round-ovate obtusely crenate radical leaves which are tufted from very slender and cord-like elongate rhizomes and basal offshoots, it is very disconcerting on every trip to tidewater Virginia to see as a dominating plant of calcareous woods and fertile bottomland, never in meadows and boggy places, a coarser plant with stout almost finger-like purple basal offshoots, very large heads and, when young, a copious long tomentum at the bases of the petioles, on the unexpanded leaf-surfaces and over the unexpanded corymb, and to be obliged to call it also *S. aureus.* So different is this southern plant of rich woods from the common plant of swamp and swale northward that it, again, comes as a surprise to find that it is true *S. aureus* L. Sp. Pl. ii. 870 (1753). Linnaeus based the species primarily upon the Clayton collection, nos. 249 and 286, from Virginia, described by Gronovius, with a second reference to the *Jacobaea virginiana* of Morison and of Ray. The Clayton plant, which is the TYPE (our PLATE 800, FIG. 1) is very characteristic material of the woodland species of eastern Virginia, and phrases in the account by Gronovius but not quoted by Linnaeus are peculiarly significant to one who knows the southern plant, "leviter superne lanatis, radice parva atro-rubente", for the woodland plant of tidewater Virginia is

very striking on account of the purple or dark red stiff rhizomes and basal offshoots and the lanate tomentum of the unexpanded corymb. "Madidis & umbrosis gaudet" of the Clayton account is also wholly satisfactory. So is the contradiction between the brief italicised diagnosis of Gronovius with "*foliis crenatis*" and the fuller account below "foliis infimis rotundis ad marginem serratis", for the type shows the margin serrate-dentate or with somewhat emarginate-truncate teeth as in some of the southern specimens, while the phrase "foliis crenatis", taken over by Linnaeus, fits other specimens.

Since the common plant of the northeastern states differs in several characters from typical southern *Senecio aureus*, standing midway between it and var. *gracilis* (Pursh) Wood, and since the more northern membranous-leaved plant (of Newfoundland, Anticosti, Gaspé, northern New England, etc.) which has erroneously passed as the Cordilleran *S. pseudaureus* Rydb., needs clarification, I am here summarizing my interpretaion of the varieties of *S. aureus:*

a. Radical leaves dentate with rounded or blunt teeth....*b.*

b. Undivided basal leaves suborbicular to round-ovate, broadly rounded at summit, with a well defined cordate base.

Basal offshoots at flowering time 4–10 mm. thick, deep red or purple; margins of basal sheaths of many petioles, surfaces of unexpanded leaves and unexpanded corymbs with long dense flocculent tomentum; involucres 8–11 mm. high; disk-corollas 6–10 mm. long; achenes 3.5–4 mm. long.....*S. aureus* (typical).

Basal offshoots at flowering time 1–5 mm. thick, green to purple; margins of basal sheaths of petioles, surfaces of unexpanded leaves and unexpanded corymbs glabrous or sparsely short-tomentose and glabrescent; involucres 5–8 (–9) mm. high; disk-corollas 5–8 mm. long; achenes 2–3.5 mm. long.

Stems 3–9 dm. high, often 2 or more; rhizomes and basal offshoots mostly 2–10 cm. long; radical leaves becoming firm and subcoriaceous, the larger ones 6–15 cm. long and 3–12 cm. broad, often purplish beneath, the longer petioles 0.5-3 dm. long; involucres 5–9 mm. high.....Var. *intercursus.*

Stems slender, mostly solitary, 2–6 dm. high; basal offshoots rarely 6 cm. long; radical leaves membranaceous, 1–3.5 cm. long, 1–2.8 cm. broad, green both sides, the longer petioles 2–10 cm. long; involucre 5–7 mm. high.....Var. *gracilis.*

b. Undivided basal leaves oblong-oval, rounded to base or some of them barely subcordate, the larger blades 2–6.5 cm. long and 1.5–4.3 cm. broad, submembranaceous.....Var. *semicordatus.*

Photo. B. G. Schubert.

SENECIO AUREUS, details from modern specimens from Virginia: FIG. 1, rhizome and basal offshoot, × 1; FIG. 2, portion of full-grown basal leaf, × 1; FIG. 3, expanding young basal leaves, showing archnoid pubescence, × 2; FIG. 4, unexpanded heads, showing arachnoid pubescence, × 2; FIG. 5, involucre, × 5

Photo. B. G. Schubert.

SENECIO AUREUS, var. INTERCURSUS, all figs. from TYPE: FIG. 1, rhizome and basal offshoots, × 1; FIG. 2, basal and lower cauline leaves, × 1, FIG. 3, involucre, × 5; FIG. 4, inflorescence, × 1

a. Radical leaves sharply serrate or dentate at least at base to acutely or subacutely lacerate, ovate or oval to rotund, deeply cordate, acute to rounded at tip, membranaceous.
Var. *aquilonius.*

S. AUREUS L. Sp. Pl. ii. 870 (1753). Var. *Ashei* Greenm. in Ann. Mo. Bot. Gard. xvi. 406, pl. 35 (1929).—Rather stout; stiff basal offshoots purple, 3–15 cm. long; flowering stems 3–12 dm. high; radical leaves rounded- to oblong-ovate, becoming coriaceous, in maturity up to 2.2 dm. long and 1.8 dm. broad.—Rich calcareous woods and wooded bottomlands or in upland meadows, Florida to Arkansas, north to Virginia, Kentucky and Missouri. The following are characteristic. VIRGINIA: locality not stated, "Madidis & umbrosis gaudet", *Clayton* (TYPE, photo in Gray Herb., our PLATE 800, FIG. 1); rocky bank of brook north of Hopewell Gap, western slope of Bull Run Mountain, *Allard*, no. 4540; margin of woods, east of Wattsville, Accomac County, *R. R. Tatnall*, no. 4441; damp woods, Eastville, April 21, 1935, *M. Ellyson & E. Puette;* rich woods, Great Neck, Princess Anne County, *Fernald & Griscom*, no. 4517; low woods, Cypress Swamp, north of Dendron, *Fernald, Long & Abbe*, no. 14,243; rich alluvial woods, east of Cabin Point, *Fernald & Long*, no. 7985; bottoms of rich calcareous wooded ravines west of Claremont, *Fernald & Long*, no. 12,893; sandy alluvial woods, bottomland of Powell Creek, Garyville, *Fernald & Long*, no. 7984. NORTH CAROLINA: wet, shady ground, Biltmore, *Biltm. Herb.* no. 889[a]. FLORIDA: banks of Little River, *Chapman.* TENNESSEE: Maryville, Blount County, May 8, 1937, *Godfrey;* low wooded slope along Bean's Creek, Franklin County, *Svenson*, no. 10,018. MISSOURI: along James R., south of Springfield, Greene Co., September, 1934, *Richard Smith & Lisle Jeffrey;* along Shoal Creek, southwest of Joplin, *E. J. Palmer*, no. 29,936. ARKANSAS: wet places, "N. W. Arkansas", April, 1888, *Harvey*, no. 45. See p. 361. PLATES 800, FIG. 1, and 801.

Senecio aureus in southeastern Virginia definitely crosses with *S. tomentosus* Michaux. In April, 1942, Long, Abbe and I found (see p. 361) an extensive colony growing at the upper border of bottomland-woods of Cypress Swamp near Dendron, with typical *S. aureus* in the woods, typical *S. tomentosus* in the open. The intermediate plants, some with narrow and merely round- to tapering-based radical leaves suggesting those of *S. tomentosus*, others with them broader and subcordate, all more or less tomentulose and with tomentose to glabrescent petioles, has the involucres tomentose. It is clearly *S. aureus* × *tomentosus*. Foliage-material, misidentified as *S. Crawfordii* Britton, from a wooded ravine west of Claremont, *Fernald & Long*, no.

12,892, is very similar but smoother, and its stout and elongate horizontal rhizome keeps it out of *S. Crawfordii* (see p. 506). It was a single plant growing with typical *S. aureus*, with *S. tomentosus* abundant only a few rods away. That much is clear.

In Ann. Mo. Bot. Gard. xiv. 406, pl. 35 (1929) Greenman described as *S. aureus*, var. *Ashei* a plant of western Virginia and adjacent northeastern Tennessee, there growing in moist meadows. Evidently having in mind as true *S. aureus*[1] the glabrescent plant of wide northern and continental range, the author of var. *Ashei* emphasized for the latter the distinctive characters of typical southern *S. aureus:* "foliis inferioribus longe petiolatis . . . crenato-serratis juventate utrinque albo-floccoso-tomentosis supra denique plus minusve glabratis". Evidently puzzled by the presence of tomentum on the young and unexpanded basal leaves in his var. *Ashei*, just such pubescence as occurs on the youngest basal leaves of the plant of Clayton's region (see PLATE 801, FIG. 3), and frequently on the involucre as well (see FIG. 5), Greenman surmised that this plant of the mountain-region of western Virginia and eastern Tennessee might be a hybrid of his *S. aureus* (presumably our var. *intercursus*) and the coastal plain *S. tomentosus:* "The origin of the plant is not known . . . It may be a hybrid. There are some indications that it may be a hybrid between *Senecio aureus* L. and *Senecio tomentosus* Michx. The former of these two species occurs in the valley of the South Fork of the Holston River, and the latter species is relatively common in eastern Virginia. While the habit of the new plant is like *Senecio aureus*, yet the prevailing outline of the leaves of the offshoots and those of the lower parts of the upright stem, as well as their texture and tomentose character, suggests *Senecio tomentosus.*"—Greenm. l. c. 405. The type of *S. aureus* var. *Ashei* was poorly collected, showing no rhizomes, but in outline of basal leaves and cauline leaves (so far as the mashed and crumpled leaves show) the foliage looks quite like that of the TYPE of *S. aureus* and of the characteristic specimens above cited and illustrated (PLATES

[1] Among the specimens taken by Dr. Greenman to Berlin for his preliminary studies one in the Gray Herbarium of a small plant midway between vars. *gracilis* and *intercursus*, from Rhode Island, bears the pencilled memorandum: "This specimen of Thurber's corresponds very well with specimens of *S. aureus* L. in herb. Willdenow at Berlin". The Thurber specimens and specimen like it at Berlin (if not now destroyed) are very different from the Clayton type.

800, FIG. 1 and 801). Although on the coastal plain true and characteristic *S. aureus* rarely crosses with *S. tomentosus*, producing a pretty mixed progeny, some plants with horizontal rhizomes and basal offshoots of *S. aureus*, others cespitose as in *S. tomentosus*, there is no reason to imagine that the cespitose, heavily and permanently tomentose *S. tomentosus*, with its narrow and noncordate radical leaves, its undivided or but shallowly toothed cauline leaves, its columnar and heavily hirtellous drab achenes (PLATE 800, FIG. 3) with prominent rounded ridges—there is no reason to imagine that such a plant, restricted to sterile soils of the Coastal Plain and adjacent provinces, had anything to do with the origin of the continental and upland species of rich or calcareous areas, with horizontal elongate rhizomes and basal offshoots, oval to orbicular and deeply cordate glabrous or glabrescent radical leaves, glabrous and deeply pinnatisect cauline ones, and glabrous, slender brown to reddish achenes (FIG. 2) without very prominent ridges. The cited stations of *S. aureus*, var. *Ashei* are more than 200 miles west of the nearest stations known for *S. tomentosus!*

Senecio aureus, var. *aurantiacus* Farwell in Am. Midl. Nat. xii. 74 (1930) is described as having red stems and "traces of floccose tomentum present throughout the plant at the flowering time". Its distinctive character, "Ligules . . . 3–4 lines long . . . , orange-red, reflexed" is one unknown to me. The description otherwise does not make clear what var. *aurantiacus* may be, in a region where many variations occur.

Var. **intercursus,** var. nov. (TAB. 802), planta glabra vel glabrata; rhizomatibus sobolibusque horizontalis 2–5 mm. crassis sobolibus plerumque 2–10 cm. longis; foliis radicalibus rotundo-vel late oblongo-ovatis cordatis, laminis glabris deinde subcoriaceis crenatis vel obtuse dentatis ad 6–15 cm. longis ad 3–13 cm. latis utrinque viridibus vel subtus purpurascentibus, petiolis longioribus 0.5–3 dm. longis; involucris glabris vel glabratis 5–9 mm. altis; disci corollis 5–8 mm. longis; achaeniis 2–3.5 mm. longis.—Meadows, boggy swales, swamps and low woods, southern Quebec to Michigan, south to Nova Scotia, New England, Pennsylvania, upland to Alabama, Kentucky and Missouri. TYPE: Tewksbury, Massachusetts, June 7, 1902, *E. F. Williams* in Gray Herb.

Var. *intercursus*, standing between the coarse, southern typical *Senecio aureus* and the smallest variety of the species, var.

gracilis (Pursh) Wood, is the plant most generally passing as typical *S. aureus*.

*Var. INTERCURSUS I have seen from Virginia only from ROANOKE COUNTY: moist woods along Back Creek, south-southeast of Starkey Post Office, *C. E. Wood, Jr.*, no. 3988. It is presumably of broader upland range.

Var. GRACILIS (Pursh) Wood, Class-Bk, 211 (1845), independently published as a new comb. by Britton in Britt. & Brown, Ill. Fl. iii. 481 (1898). *S. gracilis* Pursh, Fl. Am. Sept. ii. 529 (1814).—Meadows, swamps and bogs, Massachusetts to North Dakota (acc. to Greenman), south to North Carolina and Arkansas.

Var. SEMICORDATUS (Mackenzie & Bush) Greenm. in Ann. Mo. Bot. Gard. iii. 129 (1916). *S. semicordatus* Mackenz. & Bush in Mo. Bot. Gard. Ann. Rep. xvi. 107 (1905). *S. aureus* × *Balsamitae* Greenm. in RHODORA, x. 69 (1908).—Calcareous thickets, shores, meadows, etc., locally abundant, western Newfoundland; Gaspé Peninsula, Quebec, to southern Ontario, south to northern New Brunswick, Eastern Townships, Quebec, northern Ohio, Illinois and Missouri.

S. AUREUS L., var. **aquilonius,** var. nov. (TAB. 803), planta valde rhizomatosa, rhizomatibus gracilibus valde horizontaliterque elongatis (ad 3 dm. longis); foliis basilaribus membranaceis ovatis vel ovalibus vel rotundis serratis vel acute vel subacute incisis ad basin valde cordatis; foliis caulinis membranaceis basi pinnatifidis.—Newfoundland and Côte Nord and Anticosti Island, Quebec, to Algoma District, Ontario, south to Cape Breton, Prince Edward Island, northern New Brunswick, northern New England, northern New York, northwestern Pennsylvania, northern Ohio, northern Indiana and Wisconsin. Many specimens previously misidentified with the western *S. pseudaureus* Rydb. The following, selected from a very large series, are characteristic. NEWFOUNDLAND: brookside, Grand Falls, July 3, 1911, *Fernald & Wiegand*, no. 6398; park-like openings in damp mossy woods on the Silurian hills back of Birchy Cove (Curling), July 5, 1910, *Fernald & Wiegand*, no. 4174; spruce woods and thickets, slope of Lookout Mountain, Bonne Bay, *Fernald, Long & Fogg*, no. 2145; brooksides and damp bushy ravines on the limestone tableland, alt. 200–300 m., Table Mountain, Port à Port Bay, July 16 and 17, *Fernald & St. John*, no. 10,872; damp openings in woods near Overfall Camp, Great Codroy River, July 7, 1939, *Pease & Edgerton*. QUEBEC: dans les bois claire près de la rivière, Rivière de Rénard, Anticosti, 5 août 1927, *Victorin & Rolland*, no. 27,645; dans les bois de Conifères, R. Vaureal, Anticosti, 12 août 1927, *Victorin & Rolland*, nos. 27,640 and 27,641; mossy Arbor Vitae woods east

Photo. B. G. Schubert.

SENECIO AUREUS, var. AQUILONIUS, all figs. × 1, from TYPE: FIG. 1, elongate rhizome and basal offshoot; FIG. 2, basal leaves; FIG. 3, cauline leaves; FIG. 4, inflorescence

Photo. B. G. Schubert.

Senecio pauperculus: fig. 1, type, × 3/4, from photograph by *M. L. Fernald;* figs. 2–4, unusually tall plants, × 1, from Newfoundland

of Grande Coupe, Percé, August 6, 1907, *Fernald & Collins*, no. 1208; springy meadows in woods at 600 m. altitude, North Fork of Madeleine River, Gaspé County, July 31, 1923, *Fernald, Dodge & Smith*, no. 26,096; calcareous alpine meadows, alt. 1000–1125 m., Table-top Mountain, August 7, 1906, *Fernald & Collins*, no. 260; coniferous forest, "Low's Trail" from the Forks of the R. Ste. Anne des Monts to Table-topped Mountain, July 31 and August 14, 1906, *Fernald & Collins*, nos. 765, 766 (TYPE in Herb. Gray), 767; wet alluvial shores, between Baldé and the Baie des Chaleurs, Bonaventure River, August 5–8, 1904, *Collins, Fernald & Pease;* gravel-beaches and bars between the Forks and Brulé Brook, Little Cascapedia River, July 29 and 30, 1904, *Collins, Fernald & Pease* (*Pease*, no. 5022); slaty bank, Restigouche River, July 24–25, 1929, *Rousseau & Bonin*, no. 32,211. NOVA SCOTIA: Barrasois R., Cape Breton, *Nichols*, no. 852. PRINCE EDWARD ISLAND: swampy *Larix* and *Thuja* woods, Tignish, *Fernald, Long & St. John*, no. 8245. MAINE: wet thicket, Limestone, June 22, 1898, *Fernald;* arbor-vitae swamp, Presque Isle, July 12, 1902, *Williams, Collins & Fernald;* cedar-swamps and clearings, Blaine, June 23, 1898, *Fernald* no. 2404; damp thicket, Patten, August 23, 1897, *Fernald;* wet open woods, Roque Bluffs, July 23, 1914, *C. H. Knowlton;* meadow near Half-moon Stream, Unity, June 16, 1935, *G. B. Rossbach*, no. 926; wet ground, open woods, Clinton, July 8, 1909, *R. C. Bean;* South Poland, 1895, *Kate Furbish*. NEW HAMPSHIRE: damp shady roadside between First and Second Lakes, Pittsburg, July 6, 1907, *A. H. Moore*, no. 3523, *Pease*, no. 10,316; wet place in woods, Hill, August 29, 1933, *Chas. Bullard;* rich woods, Durham, June 21, 1939, *Hodgdon*, no. 4034. NEW YORK: Oneida, May 15, 1918, *House*. PENNSYLVANIA: Corry, May 7, 1896, *J. R. Churchill*. ONTARIO: black-ash swamp, Sault Ste. Marie, July 18, 1935, *Taylor et al.*, no. 1687. OHIO: Garrettsville, Portage County, *Webb*, no. 202. MICHIGAN: tamarack swamp, south of Ann Arbor, May 8, 1898, *S. H. Burnham;* Port Huron, May 18, 1896, *C. K. Dodge*. INDIANA: along a brook, Otis, May 20, 1911, *Sherff*. WISCONSIN: Brown County, June 11, 1900, *Schuette*.

Senecio aureus, var. *aquilonius* is the northeastern plant which has recently been passing in my own work and that of others as *S. pseudaureus* Rydb. It certainly strongly suggests the plant of the Cordilleran region in the texture and toothing of its basal leaves and the tendency to laceration and enlargement of the lower cauline blades. *S. pseudaureus*, however, has a stout and relatively short rhizome which usually forks into a tuft of crowded ascending crowns; its basal leaves tend to be oblong-ovate as in

S. aureus, var. *semicordatus* (Mackenz. & Bush) Greenm. and only slightly, if at all, more cordate, though sometimes broader, on thickish petioles 1–10 (rarely –23) cm. long; its pale-flowered heads are on pedicels 1–5 (rarely –9) cm. long. *S. aureus*, var. *aquilonius* stands off from it through its slender and horizontally creeping rhizome (up to 3 dm. long), with scattered ascending branches and tufts of leaves or flowering stems; it thus belongs with *S. aureus* var. *intercursus* and passes into it. Its basal leaves are ovate to oval or even orbicular, deeply cordate, on filiform petioles mostly 0.5–2.5 dm. long; and its deep yellow-flowered heads are on filiform pedicels mostly 3–12 cm. long.

S. AUREUS, var. AQUILONIUS, forma **ecoronatus** (Fernald) comb. nov. *S. pseudaureus*, forma *ecoronatus* Fernald in RHODORA, XXX. 225 (1928).

S. PAUPERCULUS Michx., forma **inornatus,** f. nov., foliis basilaribus indivisis angusto oblanceolatis laminis 1.5–2.3 cm. longis 0.5–0.7 cm. latis; foliis caulinis valde reductis majoribus 1.5–3.5 cm. longis 2–5 mm. latis; phyllariis[1] lineari-attenuatis; floribus discoideis, ligulis nullis.—MICHIGAN: limestone pavement, Seul Choix School, Schoolcraft County, July 12, 1935, *Pease & Ogden*, no. 24,946 (TYPE in Herb. Gray.). ALASKA: Miller House, on Steese Highway, 115 miles north of Fairbanks, elevation 2100 feet, July 12–18, 1940, *Edith Scamman*, no. 2166.

Not to be confused with *Senecio pauperculus*, forma *verecundus* Fern. in RHODORA, XXX. 225 (1928), of Anticosti, a plant which has all the technical characters of *S. gaspensis* Greenm., to which it must be transferred.

S. PAUPERCULUS Michx., var. **neoscoticus,** var. nov. (TAB. 806), planta 1–4 dm. alta; foliis basilaribus indivisis 1.5–6.5 cm. longis 1–2 cm. latis; foliis caulinis imis plus minusve pinnatifidis 3.5–6.5 cm. longis 0.7–2 cm. latis; capitulis 2–25, longe pedicellatis; involucris 4–5 mm. altis basin versus persistenter tomentosis; achaeniis glabris 2 mm. longis.—NOVA SCOTIA: talus of gypsum cliffs, Five-mile River, Hants County, July 19, 1920, *Pease & Long*, no. 22,914 (TYPE in Herb. Gray.), distrib. as var. *Balsamitae* (Muhl.) Fern.; common on gypsum, Antigonish Harbour, July 11, 1941, *A. E. Roland*, no. 41,741, distrib. as var. *Balsa-*

[1] NOTE ON THE TERM PHYLLARY.—The term PHYLLARY, now largely used instead of involucral bract, is given by Jackson, Gloss. Bot. Terms, as coming from a Latin word "*phyllaris*", with the result that those of us who have depended upon Jackson have, naturally, made an ablative plural "phyllaribus". Bentham & Hooker and other English phytographers had used the term as later defined in the Century Dictionary and as originally adopted in this country by Blake, from the New Latin PHYLLARIUM. This is preferred to Jackson's nominative.

mitae; rock-faces and crevices of gypsum cliffs, Port Bevis, Victoria County, August 27, 1920, *Fernald & Long,* no. 22,915, also distrib. as var. *Balsamitae.* QUEBEC: gravelly bank near Percé, Gaspé County, July 14, 1928, *Pease,* no. 20,177.

Var. *neoscoticus* is the only variation of the plastic *Senecio pauperculus* (PLATE 804) known to me from Nova Scotia. It superficially resembles var. *Balsamitae* (PLATE 805) in having well developed lower cauline leaves, but it is unlike any of the other varieties of the species in having densely and permanently tomentose involucres, in the TYPE the tomentum at the base of the involucre or, in some plants, extending to the tips of the phyllaries. The conventional and not too convincing distinction between *S. plattensis* Nutt. (1841) and *S. pauperculus* Michx. (1803) is the occurrence somewhere on the former (on stem, petioles, pedicels or involucre or on two or more of the areas at the same time) of more or less persistent tomentum, while *S. pauperculus* is glabrate or merely with flocculent tufts of tomentum. Furthermore, to quote Greenman, the former species has "achenes usually hispidulous along the angles, sometimes glabrous". In *S. pauperculus* we get "achenes glabrous or hirtellous along the angles". That leaves mighty little which seems specific. Nevertheless, of many scores of mature collections of *S. plattensis* which I have studied essentially all have hispidulous achenes. Of more than 200 members of the inclusive *S. pauperculus* examined all but 3 numbers have shown glabrous achenes. I am not ready to reduce *S. plattensis,* without field-acquaintance with it. But in its densely tomentose involucre *S. pauperculus,* var. *neoscoticus* might be looked upon as a connecting link. In all other characters, however, it is good *S. pauperculus.*

A southeastern variety, *Senecio pauperculus,* var. *praelongus* (Greenm.) House, found from eastern Massachusetts to Michigan, south to Connecticut, Maryland and the upland of Virginia, is strikingly similar to and has often been mistaken for the ubiquitous southern *S. Smallii* Britton. In New England, New York and Michigan it passes into *S. pauperculus* var. *Balsamitae,* while in the elongate cauline and basal leaves and the numerous heads it looks like *S. Smallii.* The latter, however, usually has copiously hispidulous achenes only 1.5–2.2 mm. long, the former glabrous achenes 2–2.5 mm. long. There seems to be a recog-

nizable difference in the phyllaries. In *S. pauperculus* they are linear-attenuate, gradually tapering from the base; in *S. Smallii* they are more definitely linear-oblong, with parallel sides, and tapering only toward the summit. In typical *S. pauperculus* and its var. *Balsamitae* (Muhl.) Fern., furthermore, the more or less elongate rhizome is commonly prostrate, with decumbent branches. In *S. Smallii* the short rhizome has crowded erect crowns. The photograph of the TYPE of *S. Balsamitae* Muhl. ex Willd. sent me by Professor Diels is of the northern few-leaved plant. I am clinging to these characters for what they may be worth.

Far to the northeast there is a series of plants of this affinity, growing from western Newfoundland to Anticosti, thence to northern Maine, which differs from *Senecio pauperculus* in usually broader and heavier foliage, the basal leaves tending to be elliptic or oval but sometimes oblanceolate, the disk very broad. These are the two extremes which were described as *S. gaspensis* Greenm. in Ann. Mo. Bot. Gard. iii. 138 (1916) and as *S. Balsamitae* var. *firmifolius* Greemn. in RHODORA, vii. 244 (1905) or *S. pauperculus* var. *firmifolius* (Greenm.) Greenm. in Ann. Mo. Bot. Gard. iii. 166 (1916). In their extremes the two are very different, but some of the larger specimens cited by Greenman as var. *firmifolius* are inseparable from smaller ones determined or cited by him under *S. gaspensis*. Typical *S. gaspensis* differs still further from *S. pauperculus* in having the undivided basal leaves broader (1.5–4.5 cm. broad, the basal leaves of *S. pauperculus* ranging from 0.5–2 cm. broad). Furthermore, in both typical *S. gaspensis* and in *S. pauperculus* var. *firmifolius* the phyllaries are linear-oblong, with parallel (instead of gradually converging) sides, tapering only near the tip. This apparently fairly definite species also includes the discoid form of Anticosti which, before I had spent two weeks upon the group, I placed under *S. pauperculus*. As I understand the plants I should now treat them as follows.

S. GASPENSIS Greenman in Ann. Mo. Bot. Gard. iii. 188 (1916). Stem 2–6 dm. high; undivided basal leaves with the larger blades 3.5–8 cm. long and 1.5–4.5 cm. broad; flowering stem very leafy; larger cauline leaves 5–12 cm. long, 1–3 cm. broad, chiefly pinnatifid only below the middle; pedicels mostly 2–10 cm. long; glabrous achenes 2.5–3 mm. long.—Bottomlands, damp shores,

Photo. B. G. Schubert.

Senecio pauperculus, var. Balsamitae: fig. 1, type of S. Balsamatae Muhl., × 1, kindness of Professor *Ludwig Diels;* figs. 2, 3 and 4, portions of a modern specimen from type-region, × 1; fig. 5, involucre, × 5, from latter specimen

Photo. B. G. Schubert.

SENECIO PAUPERCULUS, var. NEOSCOTICUS, all figs. from TYPE: FIGS. 1 and 2, base, cauline leaves and inflorescence, × 1; FIG. 3, involucre, × 5

swamps and calcareous cliffs, Anticosti Island and Gaspé Peninsula, Quebec, to upper St. John River, Maine (where apparently crossing with *S. pauperculus*, var. *Balsamitae*).

Forma **verecundus** (Fern.), comb. nov. *S. pauperculus*, forma *verecundus* Fernald in Rhodora, xxx. 225 (1928).—Swamps, flats and calcareous talus, Anticosti Island.

With the recognition of *Senecio gaspensis*, the discoid form from Anticosti, of which I now have several numbers, finds its place there.

Var. **firmifolius** (Greenm.), comb. nov. *S. Balsamitae*, var. *firmifolius* Greenm. in Rhodora, vii. 244 (1905). *S. pauperculus*, var. *firmifolius* Greenm. in Ann. Mo. Bot. Gard. iii. 166 (1916).—Stems 0.2–2 dm. high, stiffly erect, often much tufted; undivided basal blades 1–8 cm. long, 0.7–2.5 cm. broad; flowering stem nearly naked except at base or with greatly reduced leaves 1–3.5 cm. long and rarely 1 cm. broad; pedicels 0.2–5 cm. long; achenes 2.4–2.6 mm. long.—Dry calcareous rock, shingle and talus, western Newfoundland; Côte Nord (Betchouane), Anticosti and Gaspé Peninsula, Quebec.

With *Senecio pauperculus*, *S. Smallii*, *S. gaspensis* and, perhaps, *S. plattensis* showing possibly more recognizable characters than they have usually been accorded, there remains the local *S. Crawfordii* Britton. This local species has linear-attenuate phyllaries somewhat as in *S. pauperculus* and its varieties, few large heads and the well developed basal leaves on very prolonged petioles, so that the typical lower blades are only one fifth to one third as long as the erect petioles. The elongation of petiole was probably induced by its often paludal habitat. A most significant character seems to have been overlooked. In *S. pauperculus* and *S. gaspensis* there is a more or less elongate and creeping or decumbent rhizome, from which spring leafy tufts independent of the flowering stem (snatched or merely jerked-up specimens rarely show good rhizomes). In all the material of *S. Crawfordii* I have seen the rhizome is reduced to a short vertical or ascending crown which is praemorse and not creeping. When Mr. Long and I collected in Surry County, Virginia, a few leaf-specimens which we mistook for *S. Crawfordii*, we did not have the rhizome in mind. Our Surry County material (no. 12,892), reported under that name, has a strongly developed horizontal rhizome. It seems to belong with a series collected by Mr. Long, Dr. E. C. Abbe and me, also in Surry County (*Fernald, Long & Abbe*, no.

14,245) which is an unquestioned hybrid of *S. aureus* L. and *S. tomentosus* Michx., the series occurring with the two parents and combining their characters.

Returning to *Senecio Crawfordii*, the short praemorse crown-like rhizome, the very long petioles and the other characters above noted clearly mark it. Although local, the species has a broader range than usually assigned it. I am quite incapable of separating from it the TYPE from Indiana of *S. obovatus*, var. *umbratilis* Greenm. in Ann. Mo. Bot. Gard. iii. 115 (1916). It has the short praemorse erect rhizome, the long-petioled elliptic-oblong basal leaves, the cauline leaves and the heads so nearly identical with isotypic material from Mr. Joseph Crawford himself that the only difference I can see is that the type of *S. obovatus* var. *umbratilis* is in young anthesis, the Crawford material in fruit. Similarly the Tennessee material cited under *S. obovatus* var. *umbratilis* (*S. M. Bain*, no. 421) is so similar to characteristic *S. Crawfordii* from Camden County, New Jersey (*Witmer Stone*), Bristol, Pennsylvania (*Fretz*) and Suitland, Maryland (*Blake*, no. 9391), that it looks as if it were collected with any one of them. Material from open peaty pineland near Middlesex, Nash County, North Carolina, *Godfrey & White*, no. 7017, correctly identified as *S. obovatus*, var. *umbratilis*, is to me inseparable from the Stone, Fretz, Blake and Bain specimens of *S. Crawfordii*, a species which is evidently a southern one reaching a northeastern limit in eastern Pennsylvania and adjacent New Jersey.

Senecio obovatus Muhl. is a stoloniferous plant, with creeping rhizomes derived from the elongate stolons; its obovate to subrotund radical leaf-blades are decurrent into the relatively short and upwardly broadened petioles; its relatively short involucre with few phyllaries abruptly tapering from above the middle. It is very different from *S. Crawfordii*, which is a plant of low grounds (meadows and bogs), whereas *S. obovatus* thrives on calcareous rocky or rich wooded banks; it would be quite unhappy in an acid bog. Not all plants referred in the original account to *S. obovatus* var. *umbratilis* are *S. Crawfordii*, however. Many of them I have not seen, but Bush's no. 1356 from woods, Fulton, Arkansas, is so like a specimen from Williams's Bluff, Knoxville, Tennessee, of the reputedly endemic Knoxville specialty, *S.*

obovatus var. *diversifolius* Greenm. that I can find no difference. The latter very luxuriant series is rather closely approached by overgrown individuals as far away from Knoxville as New England. It seems like overgrowth in unusually favorable conditions.

S. OBOVATUS Muhl., var. **Elliottii** (Torr. & Gray), stat. nov. *S. Elliottii* Torr. & Gray, Fl. N. Am. ii. 443 (1843).

Typical *Senecio obovatus* and its var. *rotundus* Britton are slender and glabrous or promptly glabrescent plants. From the mountains of eastern West Virginia to Alabama and northwestern Florida var. *Elliottii* stands off as a stout plant, with the stems, petioles, often the lower leaf-surfaces and the short pedicels at first arachnoid-tomentose. The radical leaves are more coriaceous than in typical *S. obovatus*, the upwardly dilated petiole obsolete or very short. This is *S. Elliottii* as described by Torrey & Gray, with stem "floccose-woolly when quite young. Radical leaves . . . 2–3 inches in diameter, frequently coriaceous . . . the winged petiole . . . much shorter than the lamina", etc. Torrey & Gray, describing this plant of Georgia, Florida and Alabama, supposed it to be the *S. obovatus* of Elliott, Sketch, ii. 329; but Elliott, describing the plant found on the Santee River, distinctly said "*Stem* . . . glabrous. *Leaves* . . . glabrous," etc. There is certainly doubt whether Elliott had the coarse and pubescent plant of the upland.

The following are characteristic specimens of var. *Elliottii*. WEST VIRGINIA: shaly bank south of Great Capapon, Morgan County, *Pease*, no. 26,587; Milton, Cabell County, *Louis Williams*, no. 309. SOUTH CAROLINA: slopes of Paris Mt., Greenville, *Mackenzie*, no. 2986. FLORIDA: calcareous woods, near Mariana, Jackson County, *Harper*, nos. 53 and 3003. ALABAMA: chalky ravine near Epes, Sumter County, *Harper*, nos. 3001, 3005 and 3159.

*S. PLATTENSIS Nutt. *S. pseudo-tomentosus* Mackenz. & Bush in Trans. Acad. Sci. St. Louis, xii. 88, pl. xvii (1902).—Western Virginia: FREDERICK COUNTY: limestone ledges, Cedar Creek, *Hunnewell*, no. 12,445. SHENANDOAH COUNTY: limestone barrens, Strasburg, *Hunnewell*, no. 14,469; old field 1 mile north of Strasburg, *Allard*, no. 103, as *S. tomentosus*. ROANOKE COUNTY: limestones or dolomites, either wooded or cleared, along Roanoke River, Dixie Caverns, *C. E. Wood, Jr.*, nos. 3387, 3392, 3670, 3687, 3689, 3693, 3694, 5786–5797; steep shaly slope, with limestone ledges, partly wooded, along Roanoke River south-southwest of Wabun, *Wood*, no. 5103.

Although Greenman cites *Senecio plattensis* as extending eastward only to southern Ontario, Michigan, Indiana, Missouri, Arkansas and Louisiana, it has several times been collected in Ohio; and on July 2, 1907, Messrs. W. W. Eggleston, R. W. Woodward and C. A. Weatherby collected very characteristic material of it on limestone cliffs at North Pownal, Vermont, in a general region (southwestern Bennington County) notable for the isolation of more western species, such as *Carex Richardsonii* R. Br. (see Fernald in Rhodora, xxxiv. 229) and *Collinsia parviflora* Dougl. (see Weatherby in Rhodora, xxxvii. 422). Very characteristic *S. plattensis* (including *S. pseudo-tomentosus*) was collected on limestone ledges in Frederick County, Virginia, in 1932 by Hunnewell and soon thereafter by himself and independently by Allard near Strasburg in Shenandoah County. These specimens are inseparable, so far as I can detect, from the Vermont plant and from much *S. plattensis* from Ontario, Ohio, Michigan, Indiana, Wisconsin, Illinois and Missouri, thence westward to the Dakotas, Nebraska, Kansas, etc. They come from more or less open or exposed habitats. Mr. Wood's extensive series from along the Roanoke River is mostly from woods, bluffs and slopes. On the whole it is greener, thinner-leaved and with greater tendency to low forking of the inflorescence, but I am quite incapable of finding any morphological characters to separate it. It is smaller-headed than in some *S. plattensis* but not all, and its low-forking inflorescence and its excessive development of pinnatifid cauline leaves are readily matched in material from Ohio, Indiana, Wisconsin, Illinois, Minnesota, Missouri, Arkansas, etc. It seems to be a shade-state rather than a definite variety. In fact the numbers from less shaded habitats have thicker leaves.

In plate 800, fig. 1 shows the type (from Clayton) of Senecio aureus L.; fig. 2, an achene, × 10, from Great Neck, Princess Anne County, Virginia, *Fernald & Griscom*, no. 4517. Fig. 3, achene, × 10, of S. tomentosus from Buckroe, Virginia, *B. L. Robinson*, no. 410.

Plate 801, S. aureus: fig. 1, base, × 1, from Great Neck, Princess Anne County, Virginia, *Fernald & Griscom*, no. 4517; fig. 2, portion of mature basal leaf, × 1, from west of Claremont, Virginia, *Fernald & Long*, no. 12,893; fig. 3, unexpanded basal leaf, × 2, from Garysville, Prince George County, Virginia, *Fernald & Long*, no. 7984; fig. 4, portion of unexpanded corymb, × 2, from no. 7984; fig. 5, involucre, × 5, from western slope of Bull Run Mountains, Fauquier County, Virginia, *Allard*, no. 4540.

Plate 802, S. aureus, var. intercursus, n. var., all figs. from type: fig. 1, base, × 1; fig. 2, foliage, × 1; fig. 3, corymb, × 1; fig. 4, involucre, × 5.

PLATE 803, S. AUREUS, var. AQUILONIUS, n. var., all FIGS. × 1, from TYPE: FIG. 1, base; FIG. 2, basal leaves; FIG. 3, cauline leaves; FIG. 4, corymb.

PLATE 804, S. PAUPERCULUS Michx.: FIG. 1, TYPE, × ¾, original photograph by the author; FIGS. 2 and 3, exceptionally tall plant, × 1, from wet peat, Port aux Basques, Newfoundland, *Fernald, Long & Dunbar,* no. 27,160; FIG. 4, basal tuft, × 1, from no. 27,160.

PLATE 805, S. PAUPERCULUS, var. BALSAMITAE (Muhl. ex Willd.) Fern.: FIG. 1, one of the two plants of type-sheet, × ¾, courtesy of Professor *Diels;* FIGS. 2 and 3, flowering stem, × 1, from near Mt. Hope, Lancaster County, Pennsylvania, June 5, 1900, *Heller;* FIG. 4, basal tuft, × 1, from same collection; FIG. 5, involucre, × 5, from same collection.

PLATE 806, S. PAUPERCULUS, var. NEOSCOTICUS, n. var., all figs. from TYPE: FIGS. 1 and 2, a single plant, × 1; FIG. 3, involucre and pedicel, × 5.

*CIRSIUM VIRGINIANUM (L.) Michx., forma **revolutum** (Small), stat. nov. *Carduus revolutus* Small, Fl. Se. U. S. 1307 and 1341 (1903). *Cirsium revolutum* (Small) Petrak in Beiheft. Bot. Centralbl. xxxv. Ab. 2: 558 (1927). SUSSEX COUNTY: exsiccated argillaceous pineland about 2 miles east of Stony Creek, no. 9223.

Most certainly *Cirsium revolutum* is not a distinct species. In all characters it is like *C. virginianum* except that its lower and median cauline leaves are broader and deeply pinnatifid. Typical *C. virginianum* (as shown by a photograph of the type as well as by the original description) has the very numerous cauline leaves lance-acuminate, the lower and median ones only 0.5–1.5 cm. wide, entire or with remote, divergent, short, subulate prickles. This plant occurs in wet pineland or sphagnous or peaty bogs, swales and clearings, mostly on the Coastal Plain, from Florida to New Jersey. In forma *revolutum,* which has the same broad range, from Florida to New Jersey, the lower and median cauline leaves are 1.5–4 cm. broad and deeply pinnatifid, with lanceolate to narrowly triangular simple or forked or toothed long-pointed lobes, while the reduced upper leaves may be similar, though smaller, or quite like those of typical *C. virginianum.* The two forms seem to occur in somewhat pure stands so that all of a single station are more or less uniform. Forma *revolutum* is worthy that much recognition but surely it is not a distinct species.

Cirsium virginianum is generally supposed to extend westward to Texas, thence northward to southern Ohio, southern Indiana and southern Missouri. The plant of the Interior, however, is *C. flaccidum* Small, although its author missed some of its most important characters and restricted it to "Low pinelands, Coastal Plain, Fla. to N. C.," while the plant of the Interior

was left in *C. virginianum*. True *C. virginianum* has tuberous-thickened first year's roots (a character rarely shown in the herbarium), *C. flaccidum* slender root-fibers; *C. virginianum* has very numerous (40–70 or more) firm or coriaceous cauline leaves, *C. flaccidum* few (10–20) thin and flexible ones. In *C. virginianum* the peduncle-like flowering branches have several bracteiform leaves, in *C. flaccidum* the peduncles are naked or with only 1 or 2 bracts; in *C. virginianum* the involucre is 1.5–3 cm. high, in *C. flaccidum* only up to 2 cm. high. *C. virginianum*, of savannahs, bogs and wet pinelands of the Coastal Plain from Florida to New Jersey, flowers from mid-August to October. *C. flaccidum* of dry, acid woods, thickets and ravines, from Georgia (Small says North Carolina) and northern Florida to Texas, north to southern Ohio, southern Indiana and southern Missouri, flowers in May and June, sometimes in April.

The following taken from the Carolina and Virginia sheets in the Gray Herbarium of *Cirsium virginianum*, give, in corroboration, the habitats and flowering dates: sphagnous bog, Sept. 13; boggy depression, Oct. 18; low woods, Oct. 15; open pine and oak woods, Sept. 18; clearing, Aug. 19 (first flowers); damp pineland, Sept.; bog or savannah, Sept. 10; exsiccated argillaceous pineland, Aug. 24; pineland, Aug. 28 (first flowers); savannah, Oct. 13; pineland, Oct. 13 and Aug. 29 (first flowers); savannah, Sept. 1; sphagnous bog, Sept. 10; bog or savannah, Sept. 10 and 11. Average date September 15. All material in the Gray Herbarium of *Cirsium flaccidum* with sufficient data gives the following result: dry woods, Lookout Mountain, northern Georgia, June 4; woods near Chattanooga, Tennessee, May 23; dry woods, Talledega Co., Alabama, May 22; head of deep ravine, with *Kalmia latifolia*, Perry County, Indiana, June 4; upland woods, Polk County, Texas, May 23; dry bank, Houston, Texas, April 18. Average date May 23. Such data, associated with the different roots, many and firm or few and pliable leaves, bracted or nearly naked peduncles, etc., are decisive.[1]

[1] Sir John Hill in 1765 separated the boreal genus *Oxyria* from *Rumex*. Somewhat later Sir James Edward Smith, obviously with his own views of the general soundness of Hill's work, wrote (the reference kindly given me by Dr. Blake): "Sir John Hill, it seems, first separated this plant from *Rumex*, and gave it the above generic name. Sometimes, as Linnaeus says, a blind hen meets with a grain of corn."—Sm. Engl. Bot. ii. 189 (1828). Small had a good species but he did not know its best characters nor its range.

*Hieracium venosum L., var. nudicaule (Michx.) Farwell. For discussion see Fernald in Rhodora, xlv. 323 (1943). The only Virginian material I have seen is from the slopes of Bull Run Mountains, Prince William County, *Allard*, no. 647 and 3321. The plant of the Tidewater region is typical *H. venosum*.

A further Note on the Date of Pursh's Flora[1].—In Rhodora **40:** 354 (1938) Professor Fernald accepts 1814 as the date of Pursh's *Flora* but nevertheless accords it priority over certain plates in the *Botanical Magazine* dated by the engraver "Nov. 1, 1813" and "Dec. 1, 1813", on the assumption that these dates refer to the engraving of the plates and do not mean that the plates so dated were issued with their accompanying text on November 1 and December 1 respectively. Such a statement indicates a misconception of the purpose of the dates on eighteenth and nineteenth century prints. The plates of the *Botanical Magazine* and similar publications were dated in order to comply with the British print copyright Acts of 1734, 1766 and 1777 which gave legal protection to the inventors, designers and engravers of prints for the term of fourteen (or, after 1766, twenty-eight) years "to commence from the Day of the first publishing thereof, which shall be truly engraved . . . on each Plate, and printed on every such Print or Prints" (cf. *Journ. of Bot.* **78:** 67; 1940). Since the dates on these prints were intended to be those of their first publishing, they had to be engraved upon the plates in advance of publication and it may be that circumstances unforeseen at the time of engraving occasionally delayed publication beyond the dates given. Yet, to judge from some contemporary reviews, the issue of the monthly parts of the *Botanical Magazine* was fairly regular and in the absence of evidence to the contrary the dates engraved on its plates, though possibly not always correct to the day, must be accepted as correct to the month. They can be checked by reference to the *General Indexes to . . . the first forty-two Volumes of the Botanical Magazine* (1817) which give the contents and month of issue of each part. The title-page of volume **39** is dated

[1] In Rhodora, xlv. 415 (1943) the Editors added a footnote which, owing to the long delay in hearing from the author of the article, was allowed to stand. It now appears that it and the item referred to were based on misconception. We apologize.—Eds.

"1814" but that is the date of the first part; the first part (no. 322) was issued in November 1813. Thus *Rudbeckia columnaris* Sims (*Bot. Mag.* **39:** t. 1601; Dec. 1813) antedates *R. columnaris* Pursh (Jan. 1814) and *Lophiola aurea* Ker-Gawl (*Bot. Mag.* **39:** t. 1596; Nov. 1813) antedates *Conostylis americana* Pursh (Jan. 1814).—W. T. Stearn.

LILIUM MICHIGANENSE, L. CANADENSE AND L. SUPERBUM

Edwin D. Hull

In an article in this Journal[1], in which a wild lily from the Lake Michigan dune country of northern Indiana, called by some botanists *L. michiganense*, was compared with typical *L. superbum*, mostly from the Atlantic Coastal Plain, I concluded that *L. michiganense* was not valid, being in reality *L. superbum*. To this article Dr. Wherry[2] took considerable exception, concluding that *L. michiganense* was nearer *L. canadense* than it was to *L. superbum*, and that all three should be considered distinct, "though not necessarily in species status". Constructive criticism is welcome, but, after further field and herbarium study, I can see no reason for separating *L. michiganense* from *L. superbum* and, furthermore, *L. superbum* and *L. canadense* are distinct species.

In the dune country of Indiana there are many areas of marsh, bordering which in some instances are low woods. The lilies are found in both habitats, mostly, however, in the open. Much of this country has been drained and turned to cultivation, but there are still hundreds of flowering specimens, and many more plants which have deteriorated to a degree where they no longer flower, although they persist in a vegetative state for many years. I think no botanist would doubt after seeing these lilies that all the plants were of the same species.

Leaf-Indument. I cannot see that this is a good diagnostic character, as it is obviously a matter of environment in the specimens I have studied. The spring and early summer of 1943

[1] *Lilium superbum and L. michiganense.* Rhodora **44:** 220. 1942.
[2] *Relationship of Lilium michiganense.* Rhodora **44:** 453. 1942.

being unusually wet, some plants were found in the open with the spicules reduced to little more than papillae, whereas they are usually well-developed. In woods spicules are present usually only along the margins, the rest of the leaf being entirely smooth. In one locality, where the lilies seemed more exposed than usual, spicules were present over the entire lower surface. This is true also of the first leaves to appear above ground, which are little more than scales, and have a protective function. In my first paper were noted two specimens of typical *L. superbum* from xeric habitats, one in a salt marsh, and the other from dry, sandy soil, and the leaves of these were as roughened as any I have ever seen in the Indiana dunes.

Coloration. In 32 specimens the green zone was 10 or more mm. long in 22 cases, too many to be considered as otherwise than normal. This zone was distinct except toward the apical end, and was visible or invisible when the flower was viewed face-on according to the length of the zone and the curvature of the segments.

Stamens. As to anther-length, of 33 specimens 9 were 12 or more mm. long, the required length, it seems, for *L. superbum*. Care was taken to examine only those flowers which seemed typical, and 9 of 33 seems rather too many to be called "aberrent". Some of the flowers were studied at mid-anthesis; others could not be studied until after the pollen had been shed, when the anthers were considerably shortened. In a 2-flowered plant the anthers of one at mid-anthesis were 12 mm. long, whereas in the other flower with shed pollen the length was only 8 mm. The average anther-length was slightly more than 10 mm., whereas two years ago, as reported in my first paper, the average was about 16 mm.[3] The plants of the dune country are gradually deteriorating and consequently bearing smaller flowers, and it has been my observation that small flowers mean short anther-length as a rule. In my experience garden specimens also deteriorate after a few years.

What seems to me an important, and in my experience an entirely constant, character separating *L. superbum* from *L. canadense* is in the filaments. In *L. superbum* the upper portions

[3] A correction should be made in my first paper, p. 226, line 20. 11–12 mm. should read 11–22 mm.

of the filaments are strongly curved outward for about one-third (or perhaps more) the entire length, causing the anthers to be widely separated. In *L. canadense* the filaments are straight or nearly so throughout, causing the anthers to form a close cluster about the style. These differences are beautifully illustrated in paintings by Miss Mary E. Eaton, where *L. superbum* and *L. canadense* are shown on the same page[4]. All specimens of the so-called *L. michiganense* I have seen have filaments of the *L. superbum* type.

Ribbing of Perianth-Segments. Of 30 specimens, except for two examples, the sepal-midrib was of the *L. canadense* type as shown by Wherry. One of the exceptions showed two ridges much more rounded than those illustrated by Wherry for *L. superbum;* the other showed a number of veins which were well-raised, instead of being imbedded in the other tissues. The petal-midrib in these 30 plants showed horizontal or nearly horizontal ridges in 28 cases, the other two being only slightly rounded. Whether the ridges were narrow or wide seemed to depend on the size of the flower, there being some variance in this respect. On the whole the petal-midrib is of the *L. superbum* type.

Seeds. Seeds of the Indiana dune plants resemble those of typical *L. superbum* from the Atlantic Coastal Plain, in size, as well as other features. But they are much larger than the seeds of *L. canadense,* a typical seed being 10 mm. long (including wing) as compared with 6 mm. long in *L. canadense.*

Conclusions. It seems to me that *L. superbum* and *L. canadense* are distinct species. I cannot find any vegetative character that will sharply differentiate the two, but there are fundamental differences in the reproductive structures, and I believe botanists agree that such characters are much more stable than the vegetative ones. The so-called *L. michiganense* resembles altogether too much *L. superbum* to be removed from it, in my opinion. Mr. George L. Slate, an authority on lily-culture, in a recent article[5] does not recognize *L. michiganense,* although he mentions *L. superbum* and *L. canadense.* Slate gives the flowering time of *L. superbum* as July, the usual time for the lilies of the dune country to flower.

[4] The Book of Wild Flowers, p. 154. National Geographic Soc., 1933.
[5] The Home Garden 1: 56. July, 1943.

The following key may be helpful in distinguishing *L. superbum* from *L. canadense.*

PERIANTH-segments strongly recurved; upper portion of filaments strongly curved outward, anthers widely separated; seeds comparatively large ..... *L. superbum.*
PERIANTH-segments moderately recurved; filaments straight or nearly so; anthers close together or in contact; seeds comparatively small ..... *L. canadense.*

I wish to express my appreciation of courtesies extended by the staff of the Department of Botany of the Field Museum of Natural History.

GARY, INDIANA.

EDIBLE PLANTS.—Most botanists know ten or a dozen wild plants which are useful as food but after reading this excellent and authoritative work by Professors Fernald and Kinsey[1] the number available will reach well over 1,000. It is to be hoped that the welcome and enthusiastic cry, "There's such and such a genus, new to the region", so familiar to field-botanists, will not be too suddenly changed to, "There's Spring-Cress, we'll have it for salad at lunch!" Not only does the book make you want to get out the vasculum and digger which have been put away for the winter, but it stirs the desire for field-work of quite a different sort. Many species can be eaten during the cold months and if you read carefully, you will realize that the following of this fascinating subject can keep you adequately supplied with nourishment, if not with luxuries, for twelve months of the year.

The book has long been in preparation and that it is published during these critical times is a welcome fact; with its aid many ration coupons will be saved. It is a comprehensive volume, embracing all groups of plants, both cryptogams as well as phanerogams, and is copiously illustrated. Each species is clearly described so that one should encounter no difficulty in the identification of the plants. However, to make quite certain that no mistakes will be made on the part of those persons not intimately acquainted with the flora of the region, an excellent chapter entitled "POISONOUS FLOWERING PLANTS LIKELY TO BE MISTAKEN FOR EDIBLE SPECIES" is included. Here one finds a complete discussion of the poisonous elements, a warning as to which edible plants the poisonous ones closely resemble, and a lucid description of the lethal organs. Because these poisonous species are further classified as to the part containing the toxic principle, *i. e.* whether root, stem, leaf or fruit, it is difficult to see how errors in determination can possibly occur. In addition, careful and explicit instructions concerning the poisonous fungi are included. These are printed in **bold face type** which is a further help.

In the organization of the chapters the authors have shown excellent judgment. The first, a long one, classifies the edible wild plants according

[1] *Edible Wild Plants of Eastern North America*, by MERRITT LYNDON FERNALD and ALFRED CHARLES KINSEY. (*Special Publication*, THE GRAY HERBARIUM OF HARVARD UNIVERSITY.) The Idlewild Press, Cornwall-on-Hudson, N. Y., 1943. xiv + 452 pp. $3.00.

to uses. Thus, we find grouped together those plants suitable for purées and soups, those used as starchy or root-vegetables, cereals, nuts and breadstuffs, those which furnish cooked green vegetables, and so on. The lists are comprehensive so that anyone wishing to plan a menu consisting chiefly of native plants, can quickly go through these, making his selections from such plants as are in season and easily obtainable. The second chapter contains the admonitions regarding poisonous plants mentioned above. The third one discusses at length each species of flowering plant which possesses an edible part. The plants are systematically grouped into families, genera and species. For each species there is given an extremely clear but brief description, together with the complete range of the plant in North America, and its use or uses in culinary art. There follows a good discussion, including valuable historical material embracing significant facts from Indian lore, the personal experiences of the authors as well as those of their scientific colleagues and predecessors, together with numerous recipes. Each of these discussions is written so entertainingly and is so crammed full of useful knowledge and folklore that one can spend hours rereading them. The recipes themselves are splendid; many are quite new and have never been previously published. Even those plants about which culinary references have been made but which the authors have not personally tried are included. In such cases appropriate comments and other suggestions are freely given. The last two chapters contain the descriptions of the cryptogams and their edible species, and the bibliography.

The bibliography contains over 175 references to botanical and other journals, books, and monographs. Although the authors warn us that it is by no means complete, it is certainly comprehensive. The fact that many species owe their palatability to the experimentation of pioneer botanists, naturalists and explorers, to say nothing of the old country cookbooks of many years ago, and that these references are available in one volume, gives to the list an added significance. Though space has been a limiting factor and only short comments are included in many instances, the references to the original sources will furnish those readers desirous of delving deeper into certain aspects of the subject an excellent opportunity to explore further this vastly interesting field.

Because of the complete range given for each plant, persons living outside the region defined by the title will find the volume especially useful. About two-thirds of the species mentioned occur in the South and Middle West. This fact enhances the utilitarian value of the book and it is to be hoped that its universal interest will extend to those areas outside of "eastern North America".

The authors have succeeded admirably in their endeavor. The book is really superb in every regard and should enjoy widespread popularity. For botanists and naturalists it is, of course, a "must". For the home economist it is essential. The general reader, garden-club enthusiast and amateur scientist will also find it of immense interest.

In no sense has scholarship been sacrificed for the sake of popular appeal to the layman. But one feels that the book was written from sheer pleasure in the knowledge gained from long field-experience and with a desire to make available to others these rich accomplishments. That it is accurate and scientific as well as being written in simple, nontechnical language is an achievement for which the authors deserve great credit.

And it completely surpasses in every aspect other, and comparatively recent, books on the same general subject.

So many works are written expressly for the layman that the lessons gained from them are usually lost in the subjective viewpoint which most authors unconsciously assume. *Edible Wild Plants* consistently maintains the high standard of objectivity which its authors have set for it. As a result the layman profits immeasurably and at the same time the natural scientist is provided with a critical and scholarly book, at all times useful as a reference work of supreme importance.—Milton Hopkins, The University of Oklahoma, Norman, Oklahoma.

Trillium undulatum Willd., forma **Cleavelandicum** (Wood), comb. nov. *T. erythrocarpum*, var. *Cleavelandicum* Wood, Cl.-bk. ed. 2: 546 (1848). *T. Cleavelandicum* Swallow ex Wood, l. c., as synonym.

Although the handsomest of our species of *Trillium*, *T. grandiflorum*, is the most fickle and sporty member of the genus, with scores of described aberrant variations, the Painted Trillium, *T. undulatum*, sometimes sports, as indicated by the late Walter Deane who, in Rhodora, x. 21–24 and 214–216 (1908), described in detail plants of forma *Cleavelandicum* with the sepals simulating foliage-leaves and the true leaves in 1–3 distant whorls, and the frequent forma *polymerum* Victorin, in which the leaves are 4 or more (up to 8) in a single whorl and the flowers 4–8-merous. Forma *Cleavelandicum* was described almost a century ago, Wood's account following.

> β. *Cleavelandicum* Wood. (T. Cleavelandicum. *Swallow!*) *Sep.* developed into leaves, which are but little smaller than the true leaves; *pet.* 6, the 3 outer but partly colored. Otherwese as in α.—Brunswick, Me.! This is probably a metamorphosis; but Mr. S. has gathered it three years in succession, and also finds it thus far unaltered when cultivated from the root. Its claims to the rank of a species must be tested by plants reared from the seeds. (*Dr. T. Rickard* comm.)

Although there is no indication of the source of the name given by Mr. Swallow and taken up by Wood, it is obviously in honor of Parker Cleaveland (1780–1859), for many years President of Bowdoin College in Brunswick, where Mr. Swallow found the plant.

A sheet of the original material, sent by Mr. Swallow to Asa Gray, was discussed by Mr. Deane. In that material the petals are 6; the several sheets of specimens from Holderness, New

Hampshire, described in detail by Deane, show either 3 or 6 petals.—M. L. Fernald.

The Quebec Stations for Scirpus Peckii.—On p. 168 I recorded *Scirpus Peckii* as collected at Bellerive, Beauharnois County, Quebec, the name of the county supplied me by a native of the Province. Mr. Ernest Rouleau, Curator of the Herbarium of the University of Montreal, now writes me that the station is really at another Bellerive, this one in Labelle County. In addition to the station in Labelle (not Beauharnois) County, Mr. Rouleau calls my attention to a station on the border of Lac à la Barbotte, Saint-Jerome, Co. Terrebonne, 7 août 1940, *Victorin & Rolland*, no. 56,478. The material is thoroughly characteristic.—M. L. Fernald.

Volume 45, no. 539, including pages 417–480 and plates 783–795, was issued 13 November, 1943.

ERRATA

No. 529, Contents, line 8; *for* Bibliography *read* Biography.

Page 102, line 13; *for* West Chester *read* Westchester *and transfer* ; near Peekskill, Westchester Co., 1868, *LeRoy* to line 5 after *Topping 203.*

Page 252, line 35; for *virginicum* read *virginicus.*

Page 245, line 36; *for* Nanasquan *read* Manasquan.

Page 255, line 34; for *spica* read *spicis.*

Page 277, line 42; for *Archaechamy-* read *Archichlamy-.*

Page 375, line 30; *for* incone *read* income.

Page 414, line 8; for *Trapogan* read *Tragopogon.*

Page 420, line 2; for *donias* read *doniae.*

Page 432, line 31; for *subpumosa* read *subspumosa.*

Page 443, line 31; *for* verious *read* various.

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